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COMPOSITION OF GAS FROM A WELL AT DEXTER, KAN.

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Read before the Academy, at Topeka, December 30, 1904.

A GAS-WELL drilled at Dexter, in Cowley county, Kansas, has attracted a great deal of attention, owing to the fact that the gas which it yields will not burn. The well was drilled in 1903, and at a depth of about 400 feet a very strong flow of gas was encountered. According to measurements made by reliable parties at the well, and reported to Prof. E. Haworth, state geologist, the pressure of the gas was 120 pounds per square inch, and the rate of flow was estimated to be 7,000,000 feet per twenty-four hours.

Attempts were made to use the gas as a fuel, and it was soon found that the only way to make it burn was to turn it into a fire-box under a boiler where a good fire was already burning. Under these conditions the gas would burn and would generate enough heat to raise steam in the boiler, but as soon as the application of external heat ceased, it would no longer burn. No improvement in its combustibility was noticed after the well had been allowed to flow freely for fourteen days.

Professor Haworth, becoming interested in the gas, had a cylinder specially prepared with a valve at each end shipped to the well, where it was first filled with water, and this was then displaced by gas. By closing the lower valve and allowing the flow from the well to continue for a time the full pressure of the well was obtained in the cylinder, after which it was securely closed and sent to the University of Kansas, where it was turned over to the department of chemistry for analysis.

The results of the analysis have shown the gas to be of very unusual composition and totally different from gas from other Kansas gas-wells.

In the analysis, the methods of Hempel's gas analysis were used in the main, and these are so well known as to need no extended description. Oxygen was determined with a phosphorus pipette, carbon dioxide with strong potassium hydroxide solution, and carbon monoxide with ammoniacal cuprous chloride solution. Hydrogen was absorbed in a palladium tube, and methane was found by combustion with pure oxygen, and measurement of the resulting contraction and of the carbon dioxide formed.

The residual gas left after all of these operations, and constituting what is usually reported in a gas analysis as "nitrogen," was subjected to the treatment used by Ramsey and Rayleigh in the isolation of argon from atmospheric nitrogen. (Jour. London Chem. Soc., 1897, p. 181.) The residue was mixed with a large excess of pure oxygen, confined over mercury, and a small quantity of a strong solution of potassium hydroxide was introduced into the tube over the mercury. A spark from an induction coil was passed through the mixture for about sixty hours, and the nitrogen peroxide formed was absorbed in the potassium hydroxide solution. By means of the resulting contraction in volume the progress of the union between oxygen and nitrogen could be followed. The sparking was continued for several hours after all contraction had apparently ceased, and the residual gas was then passed into a freshly filled phosphorus pipette, where it was allowed to remain in contact with the phosphorus for several hours to insure the complete absorbtion of all excess oxygen. The residue, which measured 5.7 cc., represented 12.09 per cent. of the volume of original gas taken. It has not been further examined because of lack of time, so nothing can now be said as to its composition. As soon as time permits, the examination will be continued.

The results of the analysis are as follows:

Oxygen (O_2)	0.20	per cent.
Carbon dioxide (CO_2)	0.00	“
Carbon monoxide (CO)	0.00	“
Hydrogen (H_2)	0.80	“
Methane (CH_4)	15.02	“
Nitogren (N_2)	71.89	“
Inert residue	12.09	“
Total	100.00	per cent.

The large percentage of nitrogen and the small percentage of methane and hydrogen explain the relative incombustibility of the gas. The difference in composition between this gas and other representative Kansas gases is shown by comparison with some analyses published by Prof. E. H. S. Bailey (Kan. Univ. Quar., vol. 4, p. 10, 1895:

	Paola.	Osawatomie.	Iola.	Cherryvale.	Coffeyville.	Independence.	Neodesha.
Carbon dioxide	0.33	0.22	0.90	0.22	0.00	0.44	1.00
Olefiant gas, etc.	0.11	0.22	0.00	0.00	0.35	0.67	0.22
Oxygen	0.45	trace.	0.45	0.22	0.12	trace.	0.65
Carbon monoxide	1.57	1.33	1.23	1.16	0.91	0.33	0.50
Marsh-gas (methane)	95.20	97.63	89.56	92.46	96.41	95.28	90.56
Nitrogen	2.34	0.60	7.76	5.94	2.21	3.28	7.07
Hydrogen	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Totals	100.00	100.00	100.00	100.00	100.00	100.00	100.00

These analyses and many others published by various authors show that nitrogen is often found in small quantities in natural gases from various parts of the world. For example, three Ohio gases, from Findlay, Fostoria, and St. Mary's, analyzed by Howard (Redwood's Petroleum and its Products, vol. 1, p. 224), show, respectively, 3.41, 3.82 and 2.98 per cent. of nitrogen. Analyses by F. C. Phillips (Amer. Chem. Jour., vol. 16, p. 416) of a number of gases from points in Pennsylvania, Ohio, Indiana and New York show considerable quantities of nitrogen in almost every case, and in one case, that of a gas from Houston, near Canonsburg, Pa., 15.30 per cent. was found. In only one instance, however, have I noticed any report of a gas containing more nitrogen than that found in the Dexter well. Two samples of gas obtained by deep borings at Middleborough, England, were reported by Bedson (Jour. Soc. Chem. Ind., vol. 7, p. 662, 1888) to contain, respectively, 96.57 and 96.80 per cent. of nitrogen.

No attempt will be made in this paper to explain the formation of such enormous quantities of nitrogen as the Dexter well gives forth, this coming rather in the province of the geologist than in that of the chemist.